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NEW ASPECTS OF THE DIABETES PROBLEM

Diabetics today live longer than ever before. Basing his results on the experience of his patients, DR. ELLIOTT P. JOSLIN has shown that the duration of life from the onset of the disease to death has increased from five years, before insulin was discovered, to over eight years at the present time. The increased duration of life of the living cases must be even more striking. Thanks to the use of insulin and to the general improvement in the treatment of the disease, patients are better able to avoid coma, formerly the chief danger to them. Indeed when coma does develop, the chances for recovery are now usually excellent. As a result, the deaths of diabetics are due more often to causes characteristic of their age which so frequently complicate the disease, namely, arteriosclerotic changes in the heart, kidney and brain, gangrene, pneumonia and cancer.

Despite the increasing longevity of the diabetic, however, the total deathrate from the disease is still rising. In 1930, it was the highest on record among the Industrial policyholders of the Metropolitan Life Insurance Company and thus far in 1931 there has been no marked change from the high level of mortality of the corresponding period in recent years. On analysis, however, it has been found that the rate has declined at all ages under 45. It is only among older persons, particularly women, where the incidence of diabetes is highest, that the deathrate has increased. This rise is so marked as to outweigh the improvement at the younger ages.

In view of the favorable effects from the use of insulin, it must be clear that the upward trend in mortality from diabetes is due largely to the increase in the reported number of cases of the disease. There is every reason to believe that the cases have increased much faster than the deaths. Underlying this phenomenon is a complex of causes based on fundamental and far-reaching changes in the structure of the population which have both favored the development of the disease and have also facilitated its accurate diagnosis.

Chief among them is the process of urbanization which has been long going on in the population of this country—but at an accelerated pace within the last decade. This movement from country to city has brought profound changes into the life of these migrants. Their work is generally less laborious in their new occupations and, therefore, requires less physical energy. But, although their food requirements are less than before, the caloric value of their new and more varied diet may be even greater. Similar in its effect is the large increase in the immigrant population of American cities. To a very large extent these immigrants were recruited from the peasant population of Europe and the observations just made hold true for them. An appreciable number of these immigrants, moreover, belong to racial groups which are more than usually susceptible to the disease. The peak of this immigration took place in the decade preceding the Great War. Because most immigrants are young people, it is only now when they have grown older, that they are largely represented in those age periods in which diabetes occurs frequently as a cause of disability and of death.

The changes in the distribution of the population have had other results which indirectly aid in the detection of diabetes. An increasingly large proportion of people have gained access to better medical and hospital facilities. The demand for life insurance, too, has played its part in bringing hosts of persons under medical scrutiny. It is of great significance, in relation to diabetes, that the number of women examined for insurance has increased much faster than that of men in recent years. Incidentally, the greater mobility of the rural population has brought it more than ever before within reach of hospital facilities which even in rural areas have been appreciably extended.

Important changes have likewise occurred in the field of medicine that make for better diagnosis. The personnel of the medical profession now contains a large proportion of young men and women who, unlike the older generation of physicians, were trained from the beginning in the use of modern laboratory aids to diagnosis. The methods and equipment used have been, in their turn, so improved that the facts for diagnosis are obtained with greater rapidity, accuracy and ease. Nor should one forget the effect of the growing custom among physicians to make urinalyses as a routine matter in examining patients. Finally, the dramatic discovery of insulin and its remarkable effectiveness in saving and prolonging the lives of diabetics have received wide attention in the lay and medical press.

The interest thus aroused may well have caused physicians to give consideration to the possibility of the existence of the disease in cases which hitherto would have escaped attention, either entirely, or until the disease was far advanced and the patient beset with its complicating and terminal conditions.

Because of these and other factors, the known diabetic population has been growing rapidly. It is not surprising, therefore, that the number of deaths from the disease has likewise increased. Cases are being discovered with greater frequency and at an earlier stage, and their number is depleted by death less rapidly than formerly, because the diabetic today lives longer than the diabetic of a decade or more ago. The mortality from the disease, relative to the diabetic population itself, has probably declined despite the increase in the deathrate in the general population. At present, data on the changes in the deathrates of a diabetic population at the various ages are not available, but, fortunately, will be from a study being made by the Metropolitan Life Insurance Company of Dr. Joslin's patients who have been traced subsequent to treatment.*

THE SURVIVAL OF FAMILIES

The individual is mortal, but his lineage *may* live on indefinitely. Though each must die, and his children and children's children in turn must die, there is a chance, a definitely measurable probability, that his line of descent carrying his family name, may continue in perpetuity. In the United States at the present time, the probability is just about one in eight for any newborn male infant, that his male descendants will thus continue to perpetuate his family name. This is the figure computed on the basis of the average mortality and fertility of the white male population in the United States, using the figures for 1920; it will not be much changed when the results of the 1930 Census become available. It is possible to go into further detail and to state the probability, generation by generation, that a newborn male shall have 1, 2, 3 or more male descendants in the direct line of male descent, that is, bearing the same family name throughout. The figures are shown in the table on page 4, and those in the third column are represented in the chart on page 5.

As an illustration of the method of using the table, we may, for example, read the following items: The chances that a newborn male child shall have three male descendants in direct line in the fourth generation are 25.5 in 1,000. The chances that he shall have

*The records of patients furnished the Company by Dr. Joslin give the case numbers only.

no male descendants in direct line at all, that is, none even in the first generation, are 483 per 1,000. The chances that he shall have some male descendants (that is, one or more) in direct line in the eighth generation are 176 per 1,000.

Chances in One Thousand, that a Newborn Male Child Shall Have Specified Number of Male Descendants in Specified Generation According to Mortality and Fertility U. S. as of 1920

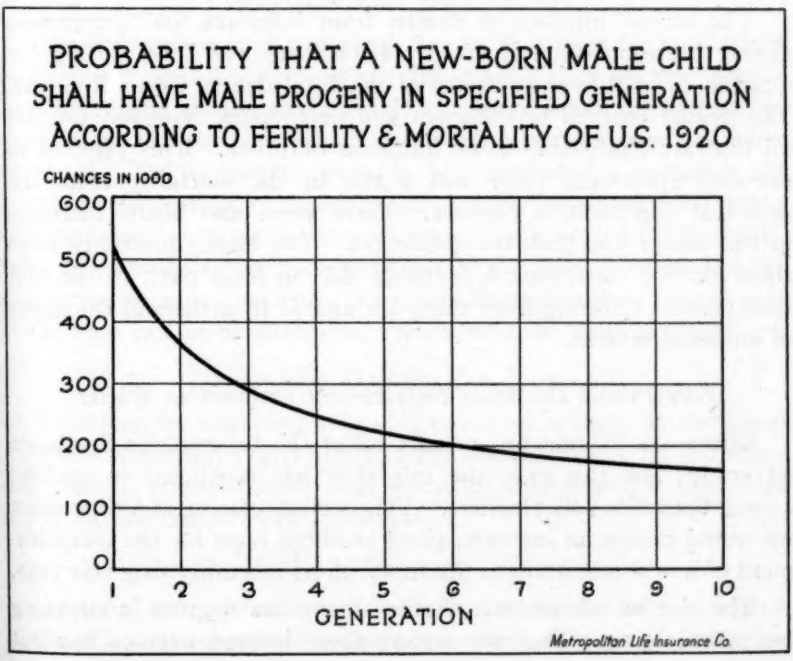
Generation	Number of Male Descendants in Specified Generation, and Chances in 1,000											
	None	One or More	1	2	3	4	5	6	7	8	9	10
1.....	482.80	517.20	228.95	127.89	71.44	39.91	22.29	12.45	6.95	3.88	2.17	1.21
2.....	634.16	365.84	98.29	72.12	52.92	38.83	28.49	20.90	15.33	11.25	8.25	6.05
3.....	707.65	292.35	53.97	44.19	36.18	29.62	24.25	19.85	16.25	13.30	10.89	8.92
4.....	750.74	249.26	33.80	29.36	25.50	22.15	19.24	16.71	14.51	12.60	10.94	9.50
5.....	778.83	221.17	22.95	20.68	18.63	16.79	15.13	13.63	12.28	11.07	9.97	8.98
6.....	798.45	201.55	16.48	15.22	14.06	12.99	12.00	11.09	10.24	9.46	8.74	8.07
7.....	812.80	187.20	12.29	11.56	10.87	10.22	9.61	9.04	8.50	7.99	7.51	7.06
8.....	823.68	176.32	9.46	9.01	8.59	8.19	7.80	7.43	7.08	6.75	6.43	6.13
9	832.13	167.87	7.41	7.13	6.86	6.60	6.35	6.11	5.88	5.66	5.45	5.25
10.....	838.81	161.19	5.90	5.73	5.56	5.40	5.24	5.08	4.93	4.78	4.64	4.50

The graph may be regarded as a sort of life curve of families. Just as we can draw a curve showing how many *persons* survive to successive ages out of 100,000 starting out upon life, so we can show the proportion of *families*, bearing a particular name, that survive through one, two, three, or more generations as the descendants of an initial cohort of male children just born, among whom no name is duplicated, so that each separate line can be identified throughout by its name. So, for example, we read from the table that out of 1,000 newborn males, 517 have one or more male descendants in direct line in the first generation, 366 have one or more in the second, and so on; 161 have one or more male descendants in the tenth generation. Thus only 16 per cent. of newborn males will have a male representative through all generations down to the tenth, and 84 per cent. will fail to be so perpetuated.

It may perhaps appear at first sight surprising that the probability of perpetuation of a given line of descent, starting from a newborn child, should be so small. But, on reflection, this will be seen to be in accord with the facts. For, in a constantly *decreasing* population, *every* family must ultimately die out; that is, the chance of indefinite survival of *any* line of descent is, in this case, zero. Now, if the fertility and mortality of the population are such as to afford only a small margin of safety above an actual decrease, then the probability of survival of a given line of descent, though no longer zero, is

nevertheless, small. And this is what occurs in the case of the population of the United States. For, as has been observed in some of our earlier issues, the present excess of births over deaths in our population is attributable very largely to the after-effects of higher fertilities in the past. When our age distribution becomes adjusted to the existing fertility and mortality, there will remain only a very small margin of excess of the birthrate over the deathrate. And this fact finds expression in another way in the small probability of ultimate perpetuation of the line of descent of any one particular individual.

While the individual is thus rather poorly protected against exhaustion of his line of descendants, a group of persons all bearing the same name affords a very high guarantee against total elimination. So, for example, though the probability that a particular John Jones just born will have no male direct descendants in the tenth generation is quite large, namely, 84 in 100, yet the chance that 50 different newborn Joneses shall all be unrepresented by males in the tenth generation in direct line is very small, namely, .84 raised to the fiftieth power. This figures out to 15 in 100,000. The chance that 100 newly born Joneses shall all of them be unrepresented in direct line in the tenth generation is two in ten millions. This practically means certainty of perpetuation of the name Jones.



MORTALITY EXPERIENCE OF THE FIRST THREE MONTHS OF 1931

The deathrate during the first quarter of 1931, despite a widespread outbreak of influenza, was at about the average figure prevailing in the winter season during the last ten years. As compared with the first quarter of 1930, which established the lowest deathrate of all time, for this period of the year, there was, of course, an increase; but the early 1931 deathrate was by no means as high as in 1929 when there was a more severe influenza outbreak than the recent one.

Health Conditions Improved in Canada

Among the Canadian Industrial policyholders, who number approximately one and a quarter millions, the deathrate during the first quarter was considerably lower than that recorded in 1930; and among policyholders in the United States living west of the Rocky Mountains, there was a slight drop in the deathrate. In the rest of the United States, however, the mortality rose from 9.7 per 1,000 in the first quarter of 1930 to 10.5 in 1931.

Influenza-Pneumonia Deathrate High

The actual number of deaths from influenza and pneumonia among Metropolitan Industrial policyholders was 7,990 during the quarter, or well over one-sixth of the total deaths from all causes. The deaths charged to influenza and pneumonia, however, are not all that are chargeable to an influenza outbreak. This year, as in previous epidemics, there was a rise in the mortality from the principal degenerative diseases. There were also sharp increases in the cancer and diabetes deathrates. The higher mortality from these chronic conditions is probably due, in large part, to the fact that persons suffering from them are unable to withstand the stress of influenza attacks.

Tuberculosis Deathrate Improvement Confined to Whites

Outbreaks of influenza usually affect the tuberculosis deathrate adversely; but this year the mortality has continued to decline, among the white policyholders. This decline, coming at a time when we would expect an increase, gives excellent hope for the establishment of a new minimum in the tuberculosis mortality rate this year.

The rise in tuberculosis deaths among the negroes is anything but encouraging. The rate among these insured negroes has not

improved during the latest decade to anywhere near the extent that has obtained among the whites. In fact, there has been virtually no improvement during the last five years.

An examination of the table on page 8 shows that the lower deathrate for tuberculosis, this year, arises chiefly from a decline in non-respiratory tuberculosis.

Principal Epidemic Diseases of Children

The deathrates for measles, scarlet fever and whooping cough show no important change since last year, but that for diphtheria has again declined to the lowest winter figure ever recorded. There is every prospect that the downward swing of the diphtheria deathrate will continue, as toxin-antitoxin immunizations and antitoxin treatments still further increase. The diphtheria deathrate dropped 34 per cent. among Metropolitan Industrial policyholders, in 1930. First quarter indications point to about the same decline in 1931, in which event, the diphtheria deathrate for the year would be cut to well below four per 100,000. In four or five more years diphtheria should be under control as complete as is typhoid fever; and the deathrate, by that time, should not exceed one per 100,000.

Cancer Deathrate Rises Sharply

There was an abrupt rise in the cancer deathrate for both white and colored policyholders. While the mortality from this disease has been rising almost continuously for many years, no such sharp increase as that in the first quarter of the current year had been observed. The influenza epidemic was probably responsible for a certain proportion of these cancer deaths, but surely not for a sufficient number to cause the pronounced rise observed in the deathrate. Too much significance must not be attached, however, to the figures for a single quarter. The cancer mortality data for the rest of the year will be awaited with even more than usual interest.

Deaths from Diabetes also Increase

The diabetes mortality rate also increased sharply as compared with the first quarter of 1930, and the rise affected both the white and colored policyholders. The diabetes deathrate this year bids fair to exceed the previous maximum.

Deathrates for All the "Degenerative" Diseases Increased

As noted in the comment under influenza, the deathrate for each of the principal degenerative diseases (organic diseases of the heart,

cerebral hemorrhage and chronic nephritis) increased appreciably. The rise for heart diseases was larger than for either of the other two conditions, but, in the case of all three, the mortality rate rose for the colored as well as the white policyholders.

Deathrates* per 100,000 Persons Exposed. Annual Basis. First Quarters of 1929, 1930, 1931 Compared. By Color for Principal Causes of Death. Metropolitan Life Insurance Company, Weekly Premium Paying Industrial Business

Causes of Death	Deathrates per 100,000 Persons Exposed*					
	White			Colored		
	Jan.-Mar. 1931	Jan.-Mar. 1930	Jan.-Mar. 1929	Jan.-Mar. 1931	Jan.-Mar. 1930	Jan.-Mar. 1929
All Causes of Death	926.5	861.8	1076.0	1647.2	1551.7	1893.7
Typhoid fever	1.0	1.0	1.2	1.7	2.0	3.1
Measles	4.0	3.4	4.2	2.0	1.4	1.2
Scarlet fever	4.5	4.2	3.9	.9	.9	.7
Whooping cough	4.1	4.8	7.0	4.8	4.8	11.1
Diphtheria	6.3	9.6	11.5	2.8	3.7	7.1
Influenza	40.8	21.6	111.9	97.4	67.1	215.0
Meningococcus meningitis	2.6	3.7	5.3	8.7	12.1	7.5
Tuberculosis (All forms)	63.9	65.3	77.2	220.5	207.8	226.3
Tuberculosis of resp'y system	57.0	57.2	68.8	198.4	180.6	202.1
Tuberculosis of the meninges, etc.	2.5	3.6	3.4	4.0	6.0	4.2
Other forms of tuberculosis	4.4	4.5	5.0	18.1	21.2	20.0
Cancer	84.3	74.8	78.7	84.3	74.4	74.2
Diabetes	24.3	20.7	24.4	25.6	21.8	24.5
Alcoholism	3.2	3.1	3.5	3.5	4.8	6.6
Cerebral hemorrhage; apoplexy	59.2	54.0	59.8†	129.8	124.7	114.6†
Organic diseases of the heart	160.5	150.1	169.0	260.5	253.7	284.9
Total respiratory diseases	131.5	115.3	168.5	241.9	210.6	302.6
Bronchitis	4.2	4.4	5.7	4.2	4.4	5.7
Bronchopneumonia	50.5	42.4	65.8	69.2	62.2	91.4
Pneumonia (Lobar and undefined)	67.7	60.1	86.1	153.5	132.9	189.6
Other diseases of respiratory system	9.1	8.4	10.9	15.0	11.1	15.9
Diarrhea and enteritis	10.4	11.5	14.1	10.1	10.9	13.0
Under 2 years	8.2	9.2	11.5	3.7	6.1	6.6
2 years and over	2.2	2.3	2.6	6.4	4.8	6.4
Acute nephritis	4.0	3.7	3.9	12.3	14.8	14.6
Chronic nephritis	66.2	63.5	73.3	136.8	120.4	135.1
Total puerperal state	11.2	13.0	14.2	16.8	17.5	22.8
Total external causes	63.6	66.7	67.1	100.3	112.3	111.3
Suicides	9.6	8.9	8.8	5.3	8.0	6.8
Homicides	3.5	3.5	3.0	28.7	29.8	29.9
Accidental and unspecified violence	50.5	54.3	55.3	66.3	74.5	74.6
Automobile accidents	17.9	17.1	15.7	20.8	17.2	13.4
All other and ill-defined causes of death	180.9	171.6	177.4	286.5	286.0	317.4

*All figures in this table include insured infants under one year of age. The rates for 1930 and 1931 are subject to slight correction, since they are based on provisional estimates of lives exposed to risk.

†Rate not comparable with that for later years.

Diarrheal Complaints; Puerperal Conditions

In addition to diphtheria and tuberculosis, two other diseases of major public health interest have registered new low points in their mortality rates. These diseases are diarrheal complaints and puerperal conditions. The improvement has applied to both races.

Violent Deaths

Suicides have increased this year among the whites but have declined appreciably among the colored. Homicides and accidental deaths have not been quite as frequent as in the first quarter of 1930. Eight hundred and eighteen Metropolitan Industrial policyholders lost their lives in automobile accidents during the quarter and the automobile accident deathrate is higher than ever before at this time of the year.

The table on page 8 presents the deathrates among white and colored policyholders respectively, for the first three months of 1931, 1930 and 1929.

HEALTH RECORD FOR MARCH, 1931

The March deathrate among Metropolitan Industrial policyholders (10.2 per 1,000) was well below the average for that month. In fact, it was lower than for any previous March, with only two exceptions. The usual seasonal rise, as compared with the mortality rate of February, was not in evidence this year. Among policyholders living west of the Rocky Mountains, the March deathrate was identical with that of March, 1930; and among the Canadian policyholders, the 1931 figure showed a small decline. But among the great bulk of the insured, who live in the United States east of the Rocky Mountains, the mortality rate increased by 9.2 per cent.

The deathrate, in the general population of the large cities of the United States, was 13.7 per 1,000 estimated population in March, as compared with 14.2 in February, and 14.0 in March, 1930. Reportable diseases showing greater prevalence in March than in February were measles and scarlet fever; those of which there were fewer case reports were diphtheria, influenza, poliomyelitis, smallpox and typhoid fever. Comparison with March, 1930, shows a greater number of cases of influenza, measles, poliomyelitis and scarlet fever, with less sickness from diphtheria, smallpox and typhoid fever. These statements are based on the number of cases reported during the first four weeks of February and March, 1931 and March, 1930.

Reports from thirty-six states show a decline in diphtheria cases. Scarlet fever cases, however, increased slightly during March, according to reports from forty-seven states; while measles cases, in thirty-nine states, increased almost 50 per cent. The most noteworthy increases in measles were in Connecticut, Ohio, Kentucky, New York, Maryland and Colorado. Reports from forty-seven states show a further decline in poliomyelitis.

It is now certain that the peak of the recent influenza outbreak has been passed. Reports from twenty-five states indicate this, as only 25,524 cases were reported in March, as compared with 41,087 cases in February.

Smallpox was not so prevalent in March as in February, according to reports from forty-seven states. In a few states, nevertheless, increases were registered, notably in Tennessee, Alabama and Mississippi.

Among the health activities of the month, the following are the more noteworthy. Congress has authorized the establishment in the UNITED STATES PUBLIC HEALTH SERVICE of a DIVISION OF MENTAL HYGIENE, the objective of which is to give medical and psychiatric service to penal and correctional institutions of the Federal Government. The BUREAU OF INDUSTRIAL HYGIENE, NEW YORK STATE DEPARTMENT OF LABOR, has begun a series of investigations of industrial diseases in order to accumulate information for the conservation of the health of workers and the administration of compensation laws. THE SOUTHERN PACIFIC COMPANY recently offered the use of a completely equipped laboratory on wheels to the HOOPER FOUNDATION FOR MEDICAL RESEARCH, UNIVERSITY OF CALIFORNIA, to assist in answering emergency calls in fighting epidemics. Full-time health units in two Mississippi counties will be established as a part of the public health program of the Commonwealth Fund.

The following table shows the mortality among Industrial policyholders for March, 1931; February, 1931, and March, 1930, together with the cumulative rate for the first three months of each year.

METROPOLITAN LIFE INSURANCE COMPANY

Deathrates* per 100,000 for Principal Causes, Premium-Paying Business in Industrial Department (Annual Basis)

MONTHS OF MARCH, 1931; FEBRUARY, 1931, AND OF MARCH, 1930

CAUSES OF DEATH	RATE PER 100,000 LIVES EXPOSED*				
	Mar. 1931	Feb. 1931	Mar. 1930	Cumulative Jan.-Mar. 1931	Cumulative Jan.-Mar. 1930
TOTAL—ALL CAUSES	1016.4	1034.4	940.6	1014.0	949.2
Typhoid fever	.9	1.3	1.1	1.1	1.2
Measles	5.5	3.0	3.6	3.8	3.1
Scarlet fever	4.3	4.1	3.3	4.0	3.8
Whooping cough	3.8	4.6	4.2	4.2	4.8
Diphtheria	4.9	5.7	6.8	5.8	8.9
Influenza	52.2	58.6	25.3	47.7	27.4
Tuberculosis (All forms)	87.1	81.9	86.1	82.9	83.4
Tuberculosis of resp'y system	79.1	72.2	75.4	74.2	72.8
Cancer	83.6	84.0	74.2	84.3	74.8
Diabetes mellitus	23.8	25.3	19.6	24.4	20.8
Cerebral hemorrhage	64.5	64.2	62.9	67.8	63.0
Organic diseases of heart	170.3	171.9	159.5	172.6	163.2
Pneumonia (All forms)	126.0	146.7	119.0	130.9	114.2
Other respiratory diseases	13.2	15.1	14.0	14.0	13.2
Diarrhea and enteritis	9.5	9.1	11.1	10.4	11.5
Bright's disease (Chronic nephritis)	73.6	75.1	70.7	74.8	70.7
Puerperal state	12.3	10.9	13.1	11.9	13.6
Suicides	9.5	9.3	9.8	9.0	8.8
Homicides	6.9	5.6	7.5	6.6	6.8
Other external causes (excluding suicides and homicides)	47.0	51.5	48.7	52.4	56.8
Traumatism by automobiles	16.3	15.3	13.9	18.3	17.1
All other causes	217.3	206.5	200.1	205.4	199.3

*All figures in this table include insured infants under one year of age. The rates are subject to slight correction, since they are based on provisional estimates of lives exposed to risk.

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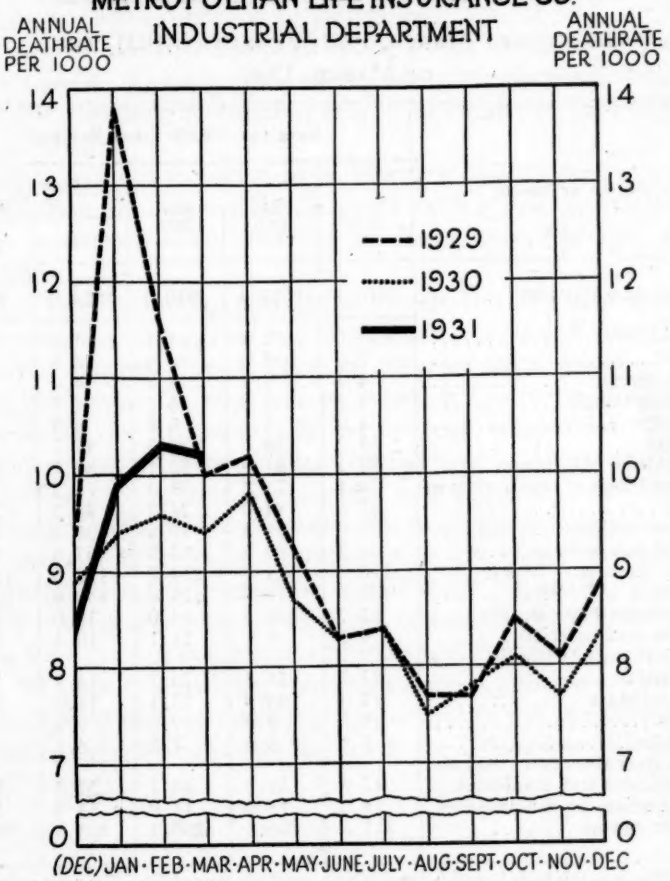
INDUSTRIAL DEPARTMENT



1929*	13.8	11.6	10.0	10.2	9.2	8.3	8.4	7.7	7.7	8.5	8.1	8.9
1930	9.4	9.6	9.4	9.8	8.7	8.3	8.4	7.5	7.8	8.1	7.7	8.4
1931	9.9	10.3	10.2									

*Rates for 1929 are final

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